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THE MV-60 COAL-CUTTING MACHINE

/Tables are appended./

MINE TESTS OF THE MV-60 CUTTING MACHINE

N. A. Shuris, A. I. Chevnenko
Ugol', No 1, 1949

The heavy-duty MV-60 cutting machine was designed by Giprouglemash, Ministry of Coal Industry of the Western Regions, and produced by the Gorlovka Coal-Machine-Building Plant imeni S. M. Kirov.

The machine is in three independently assembled sections. An electric motor, type MAD-191/11, located in the middle section, furnishes power for the forward section which houses the chain-type cutter and the rear section which houses the haulage drum. It runs on 380 volts and is capable of cutting firm coal with a long cutting jib. The top covers of the machine can be removed to permit inspection while the machine is in operation.

Nine MV 60 cutting machines were used in experiments. Five of these were tried in the Rostovugol'Combine: machines No 11 and 12 in the Mine imeni Oktyabv'skaya Revolyutsiya, No 17 in the Mine imeni "Komsomol'skaya Pravda," No 16 and 18 in the Mine imeni OGPU. The other four machines were used in the "Bokovoantratsit" Trust of the Donbassantratsit Combine: No 10 and 15 in Mine No 14, No 13 in Mine No 10, and No 14 in Mine No 2-2 bis.

Experimental conditions, operation dates, operation cycles, and productivity are shown in Table 1.

The machines operated with practically no lost time, and the average monthly production was from 1,580 linear meters (No 12) to 3,470 linear meters (No 16). These figures considerably exceed anthracite production norms and show the possibility of increased coal extraction through use of the MV-60 machine.

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On the basis of tests, observations, etc., the following facts were established:

1. The MV-60 machine is larger and weighs more than the GTK-ZM, SLE-5, and KMP-1 machines now used. For this reason it was considerably more stable at the face and was capable of using its chain cutter to its full length without once requiring supports to keep it against the face.

In spite of its height (400 millimeters), machine No 17 operated successfully in the Mine imeni "Komsomol'skaya Pravda" in a seam 0.55-0.6 meter thick, thus proving its usefulness in narrow seams.

2. The revolving chain on the MV-60 machine is strong enough to require no safety device and can easily withstand the 15,000-kilogram pressure which is the maximum the cable can exert.

3. The cutting section of the machine worked normally during the entire test period.

4. The worm-type cleaning gear worked much more satisfactorily than that of previous models which were constructed to leave a "dead space" between the worm and the cutting blade. The cleaning gear on the MV-60 left no dead space, but several construction faults were observed. The worm blade was made of 4-millimeter sheet which proved to be entirely inadequate, frequently wearing out, breaking, or bending. The worm shaft itself is too weak and the reducer would wear out after grease packing had been thrown out.

5. The Ma 191/11 electric motor was generally satisfactory. An hourly capacity of 57 kilowatts was attained, and it did not heat up excessively. However, power was less than expected, and 50 kilogram-meters instead of the expected 75 kilogram-meters (at high speed) overturning moment was developed. This deficiency is explained to a considerable degree by the faulty manufacture of the motor by the Plant imeni Karl Marx, Ministry of Electrical Industry.

Some machine parts were carelessly assembled, as is shown by machine No 18 in which the drive shaft in the section housing the haulage drum went out of order after cutting only 550 linear meters of face. One motor was burned out because of the improper assemblage of the winding stator.

6. The KRV 3006 D electric system made by the Plant imeni Karl Marx was completely unsatisfactory. The Karl Marx Plant is now starting to produce new, improved KRV 3013 systems which have block contacts and better insulation.

7. The ShVD-96150 clutch made by the Karl Marx Plant proved unsatisfactory in operation because of its weight and inferior insulation. It was made of textolite, which is moisture absorbing. After a short operating time this textolite broke up in the damp air and the clutch burned out. This happened to three of the nine machines. There were other defects in the clutches. In the future the improved and simplified ShVD 9603 clutch will be used.

8. The start and stop push buttoms also proved unsatisfactory, being improperly enclosed and too small and hard for the operator to reach.

9. The PMV-1356 starter which was intended for the MV-60 was not available so the machine worked with different starters, particularly with the PMV-1344 which was designed for the GTK ZM machine. This starter was frequently out of order because of its weak construction and poorly protected electrical system.

The tests showed that, although some changes must be made, the MV-60 can be considered finished, and production of the first group of these machines in 1948 marked the beginning of their extensive use in the Donbass mines.

TESTS IN THE "BOKOVOANTRATSIT" TRUST

M. A. Gol'din
Ugol', No 2, 1949

Comparative tests of the MV-60 with the SLE 5 and GTK-3m cutting machines were conducted in Mine No 14 of the "Bokovoantratsit" Trust.

The "Nadbokovskiy" seam K_5 has an over-all thickness of 1.16 meters and an effective thickness of 0.86 meter. It has an inner layer of quartzite and clay shale, and the coal itself is hard anthracite. The seam dips at 7 degrees. Clay shale of average stability is found in the roof and floor of the seam.

The cutting was done in the lower seam, 0.21 meter thick with quartzite impurities. Consumption of KMZ-1 bits, reinforced with "Pobedit" steel, was 0.2-0.24 bit per square meter.

At faces where the seam was less than 0.1-0.12 meter thick, cuts were made both in the coal and in the rock.

Coal was loaded at the face by two SL_2-11 scraper conveyors.

In 109 working days the MV-60 cutting machine cut 8,145 linear meters or 13,420 square meters. The cutting was done in first, second, third, and fourth speeds, rarely in fifth. This is explained by the sudden variations in the toughness of the coal along the face. The whole face, 102 meters long, was cut by the MV-60 in 4 hours 20 minutes. This time included unwinding the cable, adjusting supporting props, changing bits, and other time lost unavoidably. Cuttimg time alone was 2 hours 20 minutes.

The SLE-5 and GTK-3m machines were also used in this mine. Comparative data on these three machines are shown in Table 2, which shows that the MV-60 machine used 70 percent less electricity than the SLE-5 and 80 percent less than the GTK-3m. It produced 80 percent more than the SLE-5 and 111 percent more than the GTK-3m.

During the experimental period a number of faults were observed in parts of the MV-60 machine especially in the MAD 191/11 electric motor, but in general the machine performed very well. The following facts were established:

1. Tests showed the working parts of both the cutting and feeder parts of the MV-60 cutting machine to be entirely suitable for cutting coal of any hardness.

2. The MV-60 has six operating speeds which allow the operator to control cutting speed easily in coal of any hardness.

3. Indexes of the MV-60 are higher than those of the GTK-3 or the SLE-5 for cutting coal of any hardness.

4. The MV-60 can be directed accurately and easily.

5. The machine is stable enough to stay close to the face during cutting without requiring additional support.

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Table 1

Machine No	Depth of Seam (meters)	Length of Face (meters)	Hardness of Anthracite	Start and Finish of Operations (1948)	Undercuts: Linear Meters	Undercuts: Square Meters	No of Working Days	Operation Cycles	Breakdowns and Lost Time
10	1.1	100	Hard	5 Feb-30 Apr	6,619	10,900	83	0.8	None
13	1.1	100	Hard	1 Feb-30 Apr	5,564	9,300	82	0.69	4 Feb-6 Feb motor burned out; 14 Apr-18 Apr transfer to different face.
14	0.9	160	Superhard	7 Feb-30 Apr	5,030	8,550	75	0.42	7 Apr cleaning worm gear out of order caused by lack of grease. Reconditioned.
15	1.1	160	Superhard	21 Feb-30 Apr	2,935	4,850	38	0.48	31 Mar motor burned out.
11	0.8	145	Superhard	1 Feb-30 Apr	6,027	9,935	81	0.52	Cleaning worm gear out of order. Reconditioned.
12	0.8	110	Superhard	3 Feb-9 Apr	3,058	5,050	58	0.48	Cleaning worm gear out of order. 9 Apr motor burned out.
16	1.45	130	Average hardness	18 Feb-30 Apr	4,987	8,220	43	0.89	26 Mar-27 Apr obstruction at face.
17	0.6	150	Superhard	20 Feb-30 Apr	6,046	11,200	67	0.6	None
18	1.45	135	Average hardness	9 Mar-30 Apr	1,945	3,220	22	0.65	13 Mar through 10 Apr motor bearing out of order.

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Table 2

Indexes	Unit	Type of Cutting Machine			
		SLE-5	GTK-3	MV-60	
Date of tests	--	1 Feb 1948	2 Feb 1948	4 Feb 1948	5 Feb 1948
Face number	--	1	5	11	11
Section cut	--	Upper part of face	Upper part of face	Lower part of face	Upper part of face
Depth of cut	Meters	1.5	1.5	1.7	1.7
Length of cut	Linear meters	60	35	23	22
Amount cut	Sq meters	90	52.5	39.1	37.4
Operating time	Min	117	77	41	26
Total consumption of electricity	Kw-h	60	36.8	20.4	14.4
Comparative consumption of electricity	Kw-h/meter	0.667	0.7	0.502	0.336
Average capacity of motor during operations	Kw	30.8	28.6	30	33.2
Maximum load	Kw	60	80	66	66
Motor function	--	Erratic	Erratic	Smooth	Smooth
Coefficient of power under working conditions	--	0.6 - 0.75	0.6 - 0.85	0.6 - 0.75	0.6 - 0.75
Average advance of machine while operating	Meters/min	0.512	0.455	0.56	0.85
Productivity	Sq meters/min	0.77	0.68	0.95	1.44

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